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Why Do Part-time Workers Invest Less in Human Capital than Full-timers?

Annemarie Nelen — Andries de Grip

Abstract. We analyse whether lower investments in human capital of part-time workers are due to workers' characteristics or human resource practices of the firm. We focus on investments in both formal training and informal learning. Using the Dutch Life-Long-Learning Survey 2007, we find that part-time workers have different determinants for formal training and informal learning from full-time workers. The latter benefit from firms' human resource practices such as performance interviews, personal development plans, and feedback. Part-time workers can only partly compensate the lack of firm support when they have a high learning motivation and imagination of their future development.

1. Introduction

Several studies have found that part-time workers invest less in formal training than full-time workers (e.g. Greenhalgh and Mavrotas, 1996; Maximiano and Oosterbeek, 2007). This is an important finding because continuous upgrading of workers' skills is often assumed to be necessary to keep up with competitors. Human capital theory explains the lower training participation of part-time workers by lower incentives to invest in their human capital investments because part-timers have less working time to benefit from training investments. This holds both for the worker him- or herself and for the employer. However, in human capital literature there is no evidence on how this is effectuated. In this paper, we analyse the differences between part-time and full-time workers in the

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determinants of both formal training and informal learning. Building on human capital theory, we focus on determinants related to both the demand and the supply side of the labour market.

We contribute to the existing literature in two ways. First, there are hardly any studies that analyse to what extent it is the firms or the part-time workers themselves who are responsible for the lower investment in human capital of part-time workers. The only exception we know is Maximiano and Oosterbeek (2007), which focuses on participation in formal training. We analyse to what extent the differences in both formal training and informal learning patterns of part-time workers are demand- or supply-led by distinguishing between workers' psychological characteristics and firms' human resource practices. Second, we broaden the literature on Human Resource Management (HRM), which generally relates different packages of human resource practices to productivity or job turnover (e.g. Ichniowski *et al.*, 1997; Lynch and Black, 1998). In this paper, we relate human resource practices to investments in both formal training and informal learning.

For our analysis, we use data of the Dutch Life-Long-Learning Survey 2007. This survey focuses on knowledge development and training behaviour during the life cycle. We estimate separate human capital investment equations for part-time and full-time workers. To control for selectivity into employment status we use a Heckman-type selection correction model. We find that determinants of formal training and informal learning are different for part-time and full-time workers. In contrast to Maximiano and Oosterbeek (2007), we find that lower human capital investments for part-time workers are mainly demand-led. The human capital investment behaviour of part-time workers is influenced most by psychological characteristics such as imagination of future development, whereas full-time workers are particularly positively influenced by their firms' human resource practices such as performance interviews, personal development plans, and feedback.

The structure of this paper is as follows. The next section gives a brief review of the relevant literature. Section 3 describes the data and gives some descriptive statistics. In Section 4, we describe the estimation method and show the main results. Section 5 concludes.

2. Related literature

Human capital theory states that both firms and workers weigh the costs and benefits of investing in training (Becker, 1964). As

training participation lowers current productivity and increases productivity after training, the working time during which workers can benefit from higher future earnings is important for the decision to invest. As part-timers work by definition fewer hours, they are expected to participate less in training and spend less time on informal learning because they have less time to benefit from their investments, whereas the investment costs of a particular training are the same for part-time and full-time workers. For the same reason, employers will benefit more from investing in full-time workers than in part-time workers. The human capital argument holds for both formal training and informal learning. Whereas investments in formal training refer to both direct and indirect costs, informal learning still requires indirect investment costs in the form of foregone productivity.

Greenhalgh and Mavrotas (1996) found that both part-time men and part-time women have a lower training probability than their full-time counterparts, whereas Maximiano and Oosterbeek (2007) more specifically found that workers' training probability increases when contractual working hours increase. The latter also provides a framework in which it is possible to differentiate whether training participation is caused by the employee or employer. One of their conclusions is that part-time workers participate less in training as a result of both the workers and the firms being less willing to invest. However, Maximiano and Oosterbeek (2007) did not analyse the underlying determinants of the difference in training investments.

Several streams of literature deal with determinants of workers' human capital investments. This might help to explain the *willingness of employees to invest* in human capital. The generally analysed determinants of workers' training include age, level of education, gender, marital status, and number of children (e.g. Greenhalgh and Mavrotas, 1996). Furthermore, individual discount rates might be related to educational participation (Becker, 1964). Individuals with a high discount rate are expected to invest less in their human capital. However, empirical evidence for this result is scarce (e.g. DellaVigna and Paserman, 2005; Fersterer and Winter-Ebmer, 2003; Munasinghe and Sicherman, 2000). A more recent phenomenon in economic literature: the possible relationship between psychological characteristics that relate to time preferences and investments in human capital. Golsteyn (2007) analysed the effects of imagination on investments in human capital. He found that workers with more imagination invest more in their skill deficiencies. Whereas Golsteyn (2007) related imagination to the quality of

human capital investments, we will relate imagination to the quantity of human capital investments. In psychological literature, the emphasis is on the relationship between workers' motivation for learning and training participation. Birdi *et al.* (1997) found a positive relation between learning motivation and training participation.¹

The literature on HRM focuses on various human resource practices that express the *willingness of firms to invest* in their employees, such as performance interviews, personal development plans, and career plans. However, most of the HRM literature analyses the relationship between human resource practices and outcomes such as productivity and job turnover (for an overview, see Wood, 1999). Human resource practices of firms aim at maintaining and upgrading the skills of their workers. As these human resource practices are often complementary and performance levels of firms probably do not depend on single human resource practices, most of the existing literature analyses the role of a set of related human resource practices (e.g. Arthur, 1994; MacDuffie, 1995).

There are hardly any studies that analyse the consequences of HRM on the human capital investments of employees. The analysis of Lynch and Black (1998) on the relation between high-performance workplaces (HPW) and training participation is an exception. They found a positive correlation between HPW and the proportion of workers trained. In their paper, HPW are characterized by Total Quality Management, the use of job rotation, and teams. In HPW literature there seems to be no single accepted definition for describing what characterizes such workplaces (as pointed out by Osterman, 1994). However, most studies characterize HPW by autonomous core workers who cooperate in self-responsible teams (e.g. Youndt *et al.*, 1996). Moreover, to keep workers motivated, HPW must offer incentive payments (e.g. Becker and Huselid, 1998).

Another HRM-related determinant of human capital investments of workers is *feedback*. Facticeau *et al.* (1995) analysed the role of social support variables (different types of colleague feedback) on the spillover of formal to informal training. They found a positive relation between subordinate, peer, and top management support and perceived training transfer. The way in which feedback is given may also influence training behaviour. Prospect theory argues that perceived losses feel much worse than gains of the same size feel good (Kahneman and Tversky, 1979). An application of this theory is the analysis by McFarland and Miller (1994), which

showed that recipients of feedback have more positive reactions and report higher ability levels when they focus on the positive features of feedback compared with the negative features. They separated these two forms of feedback by comparing the number of other workers in the same firm who performed better or worse than they did themselves. Thaler (1999) showed that the difference in perceived losses and gains can in turn influence decisions substantially. As far as we know, the effects of positive and negative feedback on human capital investments at the work floor have never been analysed.

3. Data and descriptive statistics

For our analyses on the relationship between part-time employment and human capital investments, we use the Dutch Life-Long-Learning Survey 2007. This survey is a supplement to the basic questionnaires of the DNB Household Panel. This panel consists of 2,361 individuals who form a representative sample of the Dutch population of 16 years and older. Supplements to this panel provide information on specific topics. The Life-Long-Learning Survey focuses on knowledge development and training behaviour during the life cycle. The response of this survey is equal to 1,775 respondents (which is approximately 75 per cent).

For our analysis, we only use information on employed persons. This leaves us with a data set of 864 respondents. We furthermore divide the sample into part-time and full-time workers based on actual working hours.² We defined workers who work less than 33 working hours per week as part-time workers. There are different definitions of part-time work in the Netherlands (cf. De Grip *et al.*, 1997). The definition is in fact occupation-related. Statistics Netherlands defines part-time workers as workers who work more than 12 and less than 35 hours per week. As this definition qualifies full-time shift workers in some sectors of industry as part-time workers and excludes those who work less than 12 hours per week, we did not use this definition. Another difference with our definition is that Statistics Netherlands includes all pupils and students who work besides their studies. The DNB Household Survey takes 32 hours per week as the threshold.³ We decided to set the threshold at 33 hours per week so that people who work 4 days a week (32 hours) are defined as part-time workers. The sample counts 51 persons who work 32 hours per week, so we assigned 32 persons to the

part-time group, who would have been defined as full-time workers by the DNB Household Survey. Those working 33 hours per week or more are defined as full-time workers.

The disadvantage of using actual working hours is that some respondents reported extreme numbers of working hours (e.g. 82). We therefore truncate the hours worked of 43 persons who reported to work more than 50 hours per week. The sample consists of 270 part-time workers (55 men and 215 women) and 594 full-time workers (444 men and 150 women). The percentage of part-time workers is about 31 per cent, which is 6 percentage points lower than the percentage of part-time workers in the Netherlands in 2005 as measured in the Labor Force Survey.

From the Life-Long-Learning Survey, we derive the following variables.

3.1 *Human capital investments*

Human capital investments are divided into two types: formal training and informal learning. The upper part of Table 1 shows which questions are used to construct the human capital variables. To measure formal training, we created two variables: (1) training participation as a dummy variable, which is equal to one if the respondent attended one or more trainings during the last 2 years, and zero otherwise; (2) the number of courses and trainings in which the respondent participated in the last 2 years.

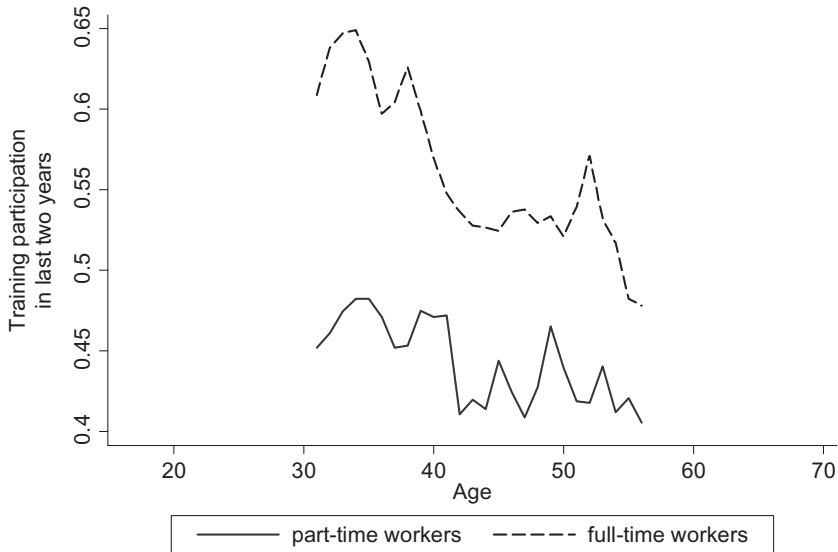
Figure 1 shows training participation for part-time and full-time workers over the life cycle (based on 11-year moving averages). Two features in line with human capital theory arise from the figure. First, part-time workers participate less in training than full-time workers at all ages. Second, the training gap is the largest for younger workers: whereas 45 per cent of the 30-year-old part-time workers attended at least one training in the last 2 years, more than 60 per cent of the full-timer workers of the same age participated. Over the life cycle this difference declines. Table 2 shows that 57 per cent of the full-time workers participated in one or more formal training courses in the last 2 years, compared with only 45 per cent of the part-time workers. The table also shows that part-time workers participated on average in 1 course, whereas full-time workers attended in 1.4 courses in the last 2 years.

Even though economic literature has focused mainly on formal training, recent research (Borghans *et al.*, 2007) found that by far the largest part of the time workers invest in their human capital

Table 1. Construction of variables

	Question	Scale
<i>Human capital development</i>		
Formal training	How many courses and/or trainings did you follow during the last 2 years? Leave aside pure hobby courses/trainings, except when they are relevant for your work as well.	
Informal learning	What percentage of your working time do you spend on tasks from which you can learn?	
<i>Explanatory variables</i>		
<i>Psychological characteristics</i>		
Imagination	To what extent do you have a clear idea about how you would like to develop yourself in the next few years?	1 to 7
Learning motivation	I always like learning new things.	1 to 7
<i>Human resource development</i>		
	Does your employer pay attention to your performance and/or career development by means of the following ways:	
Performance interview	• Performance interview	Yes/no
Personal development plan	• Personal development plan	Yes/no
Career plan	• Career plan	Yes/no
<i>High performance workplace</i>		
Team meetings	Meetings	Yes/no
Autonomy	I have a great deal of freedom to decide how to perform tasks.	1 to 7
Incentive payments	Performance payments	Yes/no
<i>Feedback</i>		
Positive feedback	To what extent do people at work always tell you when you completed a task successfully?	1 to 7
Critical feedback	To what extent do people at work always tell you how you can improve your performance?	1 to 7

development refers to informal learning. Informal learning is defined as time spent on tasks from which one can learn. The question used is: *What percentage of your working time do you spend on tasks from which you can learn?* Table 2 shows that part-time and full-time workers spend about the same fraction of their working time on tasks from which they can learn. On average, workers report to spend about 28 per cent of working time on informal

Figure 1. Training participation by employment status

Source: Dutch Life-Long-Learning Survey 2007.

Note: Figure is based on 11-year moving averages (computed over the age-interval 5 years above and 5 years below a certain age).

learning.⁴ For our analysis we use informal learning as a fraction of working time (dividing the percentage by 100).

However, because of the difference in working hours between part-time and full-time workers, part-timers score lower on informal learning measured in hours. Figure 2 shows informal learning over the life cycle. It shows the same patterns as Figure 1. Again, we see that part-time workers invest less in their human capital development than full-time workers. Whereas 30-year-old part-time workers spend on average about 8.5 hours on tasks from which they can learn, full-time workers spend almost 14 hours on informal learning per week. Furthermore, a negative relationship exists between investments in informal learning and age. This is exactly what we expect, as older workers, on average, know more and therefore have less learning opportunities from tasks they perform.

3.2 Explanatory variables

The explanatory variables are divided in two groups: psychological characteristics and HRM-related variables. The lower part of

Table 2. Characteristics by employment status

	Part-time workers		Full-time workers	
	Mean	Standard deviation	Mean	Standard deviation
<i>Human capital development</i>				
Formal training				
Training participation	0.452	0.499	0.569	0.496
Number of training courses	1.052	1.640	1.431	2.129
Informal learning				
In hours per week	6.861	7.103	11.927	11.823
In per cent	27.848	27.143	28.170	27.041
<i>Explanatory variables</i>				
Psychological characteristics				
Imagination ^a	4.493	1.587	4.505	1.566
Learning motivation ^a	5.741	1.080	5.727	1.068
Human resource development				
Performance interview	0.819	0.386	0.818	0.386
Personal development plan	0.419	0.494	0.433	0.496
Career plan	0.204	0.404	0.215	0.412
High performance workplace				
Team meetings	0.826	0.380	0.806	0.395
Autonomy ^a	5.056	1.634	5.458	1.432
Incentive payments	0.144	0.352	0.335	0.472
Feedback				
Positive feedback ^a	3.400	1.693	3.172	1.591
Critical feedback ^a	3.207	1.574	3.042	1.477
Control variables				
Age	43.448	10.745	43.428	10.287
Female	0.796	0.403	0.253	0.435
Years of education	14.598	2.423	15.180	2.351
Hours	24.189	6.780	41.887	6.415
Partner	0.844	0.363	0.736	0.441
Number of children	1.233	1.101	0.998	1.171

Note: ^a Variables are on a seven-point Likert scale.

Table 1 shows which questions are used to construct the explanatory variables. Questions that are asked on a seven-point Likert scale are standardized for the analyses (mean is equal to zero and standard deviation is equal to one). In Table 2, which gives the mean and standard deviations of the variables used, these variables are reported in their original seven-point Likert scale.

We include two psychological characteristics of workers: imagination and learning motivation. Both psychological characteristics

Figure 2. Informal learning in hours of working time by employment status



Source: Dutch Life-Long-Learning Survey 2007.

Note: Figure is based on 11-year moving averages (computed over the age-interval 5 years above and 5 years below a certain age).

are asked on a seven-point Likert scale. We measure a person's imagination by the question *To what extent do you have a clear idea about how you would like to develop yourself in the next few years*. Learning motivation is measured by a question in which respondents state how much they like learning new things. The two psychological characteristics seem to be distributed fairly equally between part-time and full-time workers, as can be seen in Table 2.

As we have employee data, we do not have an exact measure for the firms' willingness to invest. However, we use HRM practices to proxy the willingness of firms to invest. These human resource practices included in the analysis are divided into three subgroups: (1) human resource development practices; (2) HPW; and (3) feedback. First, we include the practices related to human resource *development*: performance interviews, personal development plans, and career plans. The respondents were asked whether or not their employer pays attention to their performance and/or career development by means of these practices. Table 2 shows that the provision of human resource development practices

for part-time workers is of about equal size as for full-time workers. Second, we include characteristics of *HPW*: team meetings, autonomy, and performance payments. Respondents were asked to state whether or not their employer organizes team meetings and pays them according to their performance. To determine the level of autonomy, respondents could state on a seven-point Likert scale to what extent they agree with the statement *I have a great deal of freedom to decide how to perform tasks*. Table 2 shows that part-time workers have slightly more team meetings than full-timers, and about 6 percentage points less autonomy. The difference between part-time and full-time workers is the largest with respect to performance payments. One-third of the full-time workers have performance payments, compared with only 14 per cent of the part-time workers. Third, we focus on different kinds of feedback: positive and critical *feedback*. Positive feedback is measured by the statement *People at work always tell me when I completed a task successfully*. Critical feedback is measured by *At work people always tell me how I can improve my performance*. On a seven-point Likert scale, respondents could state to what extent they agree with these statements. It is remarkable to see that part-timers seem to get feedback of both types more often.

Finally, we include several control variables: respondent's age, gender, years of completed education, hours,⁵ partner, the number of children and industry.⁶ Gender and having a partner are included as dummy variables, which equal one if the respondent is feminine and has a partner, respectively, and zero otherwise. Thirteen industry dummies are included, based on the classification used in the DNB Household Survey.⁷ One can clearly see from Table 2 that almost 80 per cent of the part-time workers are women, compared with 25 per cent of the full-time employed. On average, part-time workers also have more children than full-time workers.

4. Empirical strategy and results

4.1 Empirical strategy

We will analyse whether the factors that determine the learning behaviour of part-time workers are different from the factors that determine the human capital investments of full-time workers. As

there may be variables that determine both the choice for part-time or full-time employment and the human capital investment decisions, we use the two-step Heckman-type selection correction method.⁸ Two-step estimations are preferred over the more direct Maximum Likelihood estimation, because the former is less sensible to inconsistency.⁹

In the first step we estimate the following selection equation:

$$\begin{aligned} EmploymentStatus_i = & \alpha_0 + \beta_1 age_i + \gamma_2 female_i + \delta_3 yeduc_i \\ & + \zeta_4 FTpartner_i + \eta_5 kids_i + \varepsilon_i, \end{aligned} \quad [1]$$

where $EmploymentStatus_i$, age_i , $female_i$, $yeduc_i$, $FTpartner_i$, and $kids_i$ denote the respondent's employment status (part-time versus full-time), age, gender, years of completed education, the full-time status of the partner, and the number of children for person i , respectively. As $EmploymentStatus_i$ can only take the values zero (full-time) or one (part-time), this model is estimated with a probit model.

We use the full-time employment status of the partner to correct for selection into employment groups. In the Netherlands, there is a strong tradition in which one partner works full-time and the other works part-time. Respondents living with a partner who does not work and those without a partner are treated as individuals without a full-time employed partner ($FTpartner = 0$).

In the second step, the equations of interest are estimated. For part-time and full-time workers, we separately estimate the following three human capital investment equations:

$$\begin{aligned} TP_i = & a_1 + b_1 psych_i + c_1 HRD_i + d_1 HPW_i + e_1 feedback_i \\ & + f_1 X_i + g_1 IMR_i + u_{i1}, \end{aligned} \quad [2]$$

$$\begin{aligned} TQ_i = & a_2 + b_2 psych_i + c_2 HRD_i + d_2 HPW_i + e_2 feedback_i \\ & + f_2 X_i + g_2 IMR_i + u_{i2}, \end{aligned} \quad [3]$$

$$\begin{aligned} IL_i = & a_3 + b_3 psych_i + c_3 HRD_i + d_3 HPW_i + e_3 feedback_i \\ & + f_3 X_i + g_3 IMR_i + u_{i3}, \end{aligned} \quad [4]$$

where TP_i , TQ_i , and IL_i denote the three different types of human capital investments for person i : training participation, number of training courses attended, and informal learning measured in

fractions of working time. $psych_i$, HRD_i , HPW_i , and $feedback_i$ denote the vectors of explanatory variables, and X_i is a vector with control variables. IMR_i denotes the Inverse Mills Ratios calculated from the estimation of equation [1].

As TP is a dummy variable, equation [2] is estimated with a probit model. Because TQ is a count variable that only takes a small number of values, equation [3] is estimated with a Negative Binomial Regression model.¹⁰ This model assumes overdispersion (relative to the Poisson case), i.e. that the variance is greater than the mean.¹¹ Equation [4] is estimated with Ordinary Least Squares (OLS).¹²

4.2 Results

Table 3 shows that all variables included in the selection equation are highly significant. Being female increases the chance of working part-time by almost 50 per cent. When someone has a partner who works full-time, the chance of working part-time is 13 per cent higher.

Table 3. First stage of the Heckman-type selection correction model

	Part-time coefficients	Marginal effects
Age	0.021*** (0.005)	0.007
Female	1.484*** (0.120)	0.484
Years of education	-0.087*** (0.021)	-0.028
Full-time status partner	0.382*** (0.121)	0.130
Number of children	0.160*** (0.046)	0.052
Constant	-1.136*** (0.423)	
Number of observations	864	
Pseudo <i>R</i> -squared	0.2701	
Log likelihood	-391.673	

Notes: Female and Full-time status partner are dummy variables equal to one when someone is female and has a partner working full-time, respectively, and zero otherwise.

Marginal effects are evaluated at the sample means of the data.

*** significant at 1 per cent.

4.2.1 Formal training. Table 4 reports the estimation results on the determinants of training participation of part-time and full-time workers. The table shows that learning motivation is positively related to training participation for all workers. However, the effect is much greater for part-time workers than for full-time workers. Part-time workers who have a motivation to learn, which is one standard deviation above the average, have almost 13 per cent more chance of having attended a training course during the last 2 years compared with an increased probability of about 5 per cent for full-time workers. The impact of imagination on training participation is only significant for part-time workers.

Human resource development practices, on the other hand, only stimulate training participation of full-time workers, although there is a weakly significant effect of performance interviews on training participation of part-time workers. Full-time workers with performance interviews have 15 per cent more chance of attending training. When full-time workers have a personal development plan, their chances of participating in training are also 15 per cent higher. Remarkably, having a career plan has a negative effect. However, this effect is only weakly significant. We do not find many effects of HPW on training participation of part-time or full-time workers.¹³ Only performance payments are stimulating training participation of full-time workers (at the 10 per cent significance level). Feedback does not play a role in explaining training participation of both part-time and full-time workers.

As the IMRs of part-time workers are not statistically significant, selection does not seem to play a role for part-time workers. This is in contrast to the test results shown for full-time workers. As the IMRs are highly significant, we conclude that full-time workers' training participation is affected by a selection bias.

Furthermore, it is remarkable that control variables that are often used to explain training participation, such as workers' age, years of education, and number of children, do not significantly influence workers' training participation. Gender is the only exception. Full-time working women have an increased probability of training participation. The observation that these common training determinants are not significant when the characteristics of workers and employers are included indicates that one should be careful in relating basic characteristics such as age, gender, and educational level to training behaviour, without including the workers' psychological characteristics and the firms' human resource practices.

Table 4. Determinants of training participation

	Part-time workers		Full-time workers	
	Coefficients	Marginal effects	Coefficients	Marginal effects
Psychological characteristics				
Imagination	0.250*** (0.095)	0.099	0.082 (0.061)	0.032
Learning motivation	0.319*** (0.103)	0.126	0.129** (0.062)	0.051
Human resource development				
Performance interview	0.510* (0.288)	0.192	0.377** (0.158)	0.149
Personal development plan	0.176 (0.215)	0.069	0.398*** (0.136)	0.154
Career plan	-0.039 (0.260)	-0.015	-0.284* (0.155)	-0.112
High performance workplace				
Team meetings	0.098 (0.272)	0.038	0.073 (0.151)	0.029
Autonomy	-0.043 (0.092)	-0.017	-0.008 (0.065)	-0.003
Performance payments	-0.444 (0.282)	-0.167	0.226* (0.129)	0.088
Feedback				
Positive feedback	-0.054 (0.101)	-0.021	-0.039 (0.069)	-0.015
Critical feedback	0.110 (0.099)	0.043	-0.048 (0.067)	-0.019
Control variables				
Age	-0.007 (0.013)	-0.003	0.00009 (0.007)	0.00003
Female	-0.751 (0.983)	-0.292	1.224** (0.482)	0.412
Years of education	0.046 (0.061)	0.018	-0.015 (0.032)	-0.006
Hours	0.004 (0.014)	0.002	0.017* (0.009)	0.007
Partner	-0.264 (0.298)	-0.105	0.0002 (0.145)	0.0001
Number of children	-0.164 (0.128)	-0.065	0.114** (0.058)	0.045
IMR part-time equation	-3.618 (3.290)	-1.426	-5.643*** (2.101)	-2.210
Constant	1.699 (2.534)		0.666 (0.951)	
Industry dummies	Yes		Yes	
Number of observations	266		594	
Pseudo R-squared	0.1768		0.0968	
Log likelihood	-151.038		-366.730	
Method: Heckman-type selection correction model (two stages)				

Notes: Female and Partner are dummy variables equal to one when someone is female and has a partner, respectively, and zero otherwise.

Industry dummies are included. We separate 13 industries, in the regressions; one is left out. Marginal effects are evaluated at the sample means of the data.

* Significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

Table 5 shows the estimation results of the determinants of the number of training courses workers participated in. This allows us to distinguish among the workers who participated in formal training. The table shows that psychological characteristics are not only related to training participation, but also to the number of training courses part-time workers attend. Full-time workers who are highly motivated to learn have a stronger tendency to attend more training courses. The effect of learning motivation on the number of training courses attended is similar for part-time and full-time workers. Furthermore, the number of training courses of full-time workers is influenced by human resource development practices, whereas that of part-time workers is not: performance interviews and personal development plans affect the number of training courses of full-time workers positively. The variables related to the HPW and the feedback variables do not influence the number of training courses part-time and full-time workers attend.¹⁴

Furthermore, Table 5 shows that selection plays a role for full-time workers. The IMRs are significant at the 10 per cent level. As the IMRs are not significant for part-time workers, we assume that there are no factors that influence both the employment status and human capital behaviour of part-time workers.

4.2.2 Informal learning. Table 6 shows the estimation results on the determinants of informal learning, as a fraction of working time.¹⁵ The only explanatory variable that has a strongly significant influence on part-time workers' informal learning behaviour is imagination. Part-time workers with an imagination of their future development one standard deviation higher than the average worker spend on average almost 6 per cent more working time on tasks from which they learn. On the contrary, full-time workers' informal learning behaviour does not depend on their capacity to imagine their future development or on their learning motivation. Although human resource development and HPW variables do not affect informal learning of either part-time or full-time workers,¹⁶ the latter are positively influenced by the feedback they get at work. Both positive and critical feedback positively influence the fraction of working time in which full-time workers learn informally, whereas we only find a weakly significant effect of critical feedback on informal learning for part-time workers.

As determinants of informal learning have hardly been analysed in economic literature, we will also briefly comment on the control

Table 5. Determinants of number of training courses attended

	Part-time workers		Full-time workers	
	Coefficients	Marginal effects	Coefficients	Marginal effects
Psychological characteristics				
Imagination	0.251** (0.106)	0.157	0.100 (0.061)	0.125
Learning motivation	0.410*** (0.115)	0.257	0.198*** (0.062)	0.247
Human resource development				
Performance interview	0.213 (0.321)	0.125	0.409** (0.173)	0.452
Personal development plan	0.305 (0.222)	0.197	0.508*** (0.129)	0.664
Career plan	-0.087 (0.273)	-0.053	-0.236 (0.145)	-0.276
High performance workplace				
Team meetings	0.223 (0.316)	0.130	-0.06 (0.156)	-0.076
Autonomy	-0.077 (0.096)	-0.048	-0.051 (0.065)	-0.064
Performance payments	0.091 (0.302)	0.059	0.076 (0.129)	0.097
Feedback				
Positive feedback	-0.020 (0.111)	-0.013	-0.051 (0.071)	-0.064
Critical feedback	-0.058 (0.105)	-0.036	0.0003 (0.067)	0.00003
Control variables				
Age	0.005 (0.014)	0.003	0.0003 (0.007)	0.00003
Female	0.018 (1.038)	0.011	0.807* (0.461)	1.264
Years of education	0.015 (0.062)	0.009	-0.012 (0.032)	-0.014
Hours	0.017 (0.015)	0.011	0.024*** (0.009)	0.030
Partner	0.252 (0.326)	0.145	0.094 (0.150)	0.115
Number of children	-0.125 (0.138)	-0.079	0.054 (0.059)	0.067
IMR	-2.097 (3.484)	-1.314	-4.022* (2.112)	-5.027
Constant	-0.855 (2.701)		-0.056 (0.976)	
Industry dummies	Yes		Yes	
Number of observations	270		594	
Pseudo R-squared	0.0847		0.0456	
Log likelihood	-348.409		-931.718	
Method: Heckman-type selection correction model (two stages)				

Notes: Female and Partner are dummy variables equal to one when someone is female and has a partner, respectively, and zero otherwise.

Industry dummies are included. We separate 13 industries, in the regressions; one is left out. Marginal effects are evaluated at the sample means of the data.

* Significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

Table 6. Determinants of informal learning (as fraction of working time)

	Part-time workers	Full-time workers
Psychological characteristics		
Imagination	0.058*** (0.017)	0.009 (0.011)
Learning motivation	0.012 (0.018)	0.018 (0.011)
Human resource development		
Performance interview	-0.001 (0.047)	-0.026 (0.029)
Personal development plan	0.050 (0.039)	0.024 (0.025)
Career plan	-0.009 (0.048)	0.020 (0.029)
High performance workplace		
Team meetings	0.031 (0.045)	0.051* (0.028)
Autonomy	-0.012 (0.017)	0.004 (0.012)
Performance payments	-0.025 (0.049)	-0.010 (0.024)
Feedback		
Positive feedback	-0.004 (0.018)	0.041*** (0.013)
Critical feedback	0.033* (0.018)	0.031** (0.013)
Control variables		
Age	-0.004 (0.003)	-0.004*** (0.001)
Female	0.076 (0.208)	-0.088 (0.089)
Years of education	0.005 (0.011)	0.011* (0.006)
Hours	0.001 (0.003)	0.003 (0.002)
Partner	0.045 (0.051)	-0.007 (0.027)
Number of children	0.001 (0.024)	-0.011 (0.011)
IMR	0.117 (0.175)	0.137 (0.114)
Constant	0.228 (0.334)	0.148 (0.125)
Industry dummies	Yes	Yes
Number of observations	270	594
Method: Heckman-type selection correction model (two stages)		

Notes: Female and Partner are dummy variables equal to one when someone is female and has a partner, respectively, and zero otherwise.

Industry dummies are included. We separate 13 industries, in the regressions; one is left out.

* Significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

variables. As can be seen in Table 6, age has a negative effect on informal learning for full-time workers. Full-time workers who are 1 year older spend on average around 0.4 per cent less on informal learning. Years of education only has a weakly significant positive effect on full-time workers' informal learning. Other control variables do not affect the fraction of working time spend on informal learning. As the IMRs are not significant in both the part-time and full-time informal learning equations, there seems to be no selection for both types of workers.¹⁷

4.2.3 Part-time versus full-time workers. Combining all forms of human capital investments, we can conclude that HRM policy is the main factor driving the human capital investments of full-time workers. Table 4 shows that full-time workers' chance to participate in training largely depends on the HRM practices of the firm they are working for. The role of HRM practices implies that in firms with good HRM practices, the incidence of training participation is larger. Worker characteristics do not seem to play a big role. However, this changes when we analyse the number of training courses in which full-time workers participate. Even though the two variables that identify training-oriented HRM practices are still significant, learning motivation becomes important as well. Thus, the large pool of workers who receive training is divided by motivation. Those workers with high motivation distinguish themselves from other full-time workers by attending more training courses. Table 6 shows that informal learning behaviour of full-time workers is mainly explained by age and the feedback policy of the firm.

For part-time workers, the results are different. Table 4 shows that worker characteristics determine whether part-time workers participate in training or not. Even in companies that have elaborate HRM practices, only those workers who are motivated to learn and have a clear idea about their further development get trained. For part-time workers, not only training participation, but also the number of training courses attended is driven by these two variables.

The fraction of working time in which workers perform tasks from which they learn is fairly equal for part-time and full-time workers. However, whereas full-time workers' informal learning behaviour depends most on the feedback system of the firm where they are employed, this does not hold for part-time workers. Even though part-time workers get more feedback than full-time

workers, for part-time workers, the effect of critical feedback is only weakly significant. The positive feedback part-time workers get at their work is not related to their further development. Imagination of further development is the only factor that strongly stimulates informal learning behaviour of part-time workers. Again, personal drive seems to be the most important in explaining human capital investments of part-time workers.

It is remarkable to note that for part-time workers the determinants of formal training and informal learning are fairly similar, whereas for full-time workers there is a clear difference between formal training and informal learning determinants. Even though full-time workers are on average influenced mostly by human resource practices, human resource development such as performance interviews and personal development plans only seems to affect their formal training behaviour, whereas informal learning behaviour is stimulated by feedback in the workplace. All forms of human capital investments of part-time workers are driven by workers' characteristics such as imagination of further development and learning motivation.

5. Conclusion

In this paper, we analysed the differences in the determinants of participation in both formal training and informal learning between part-time and full-time workers. Human capital theory expects both workers themselves and firms to be less willing to invest in part-time workers. We found that human capital investments of part-time workers are mainly supply-led. Psychological characteristics — imagination of one's own future development being the most important one — positively influence both formal training and informal learning. Human resource practices are hardly of any influence on part-time workers' further investments in human capital development. This is in sharp contrast with the determinants of full-time workers' participation in formal training and informal learning. Whereas psychological characteristics only affect full-time workers' formal training incidence, human resource practices are important for both formal training and informal learning. Formal training is stimulated in particular by human resource development practices such as performance interviews and personal development plans. Informal learning is positively affected by both positive and critical feedback in the workplace. It is remarkable that although

part-time workers receive more feedback than full-time workers, we do not find a strong positive effect of feedback on informal learning behaviour of part-time workers. Probably, the feedback is not related to their further development.

In conclusion, the differences in human capital investments between part-time and full-time workers are mainly demand-led. Full-time workers are positively affected by human resource practices of the firm in which they are employed. However, firms do not effectively stimulate part-time workers in a similar way. Part-time workers can only partly compensate the lack of firm support when they have a high learning motivation and imagination of their future development.

Notes

¹ Another stream of literature focuses on psychological characteristics that influence training participation through training motivation. For an overview of psychological characteristics on training motivation, see Colquitt *et al.* (2000). Examples are the role of anxiety (e.g. Webster and Martocchio, 1993), locus of control (e.g. Noe and Schmitt, 1986), and conscientiousness (e.g. Colquitt and Simmering, 1998) on training motivation.

² When analysing the determinants of both formal training and informal learning with contractual working hours instead of actual working hours, our findings are confirmed. Within the group of part-time workers the contractual working hours become significant for both formal training and informal learning. For full-time workers, even more HRM practices are significantly positively related to formal training. Thus the results of the model with contractual working hours strengthen our main conclusions.

³ Using the part-time work definition used in the DNB Household Survey leads to the same results as the findings we present in this paper.

⁴ In the first wave of the Life-Long-Learning Survey in 2004, this percentage is about 30 per cent.

⁵ The *hours* variable takes account of the effect that more working time increases the benefits of human capital as stated by human capital theory.

⁶ As the Survey does not provide information on firm size, we cannot include this in the analysis.

⁷ We combined two industries because of the small numbers of observations. It concerns industries 1 (agriculture and extracting minerals) and 3 (energy and water supply).

⁸ We also extended our selection model to control for selection into (un)employment. However, this did not affect our results.

⁹ As Maximum Likelihood estimation relies on the joint normality assumption of the errors in the selection equation and the equation of interest, misspecification of one of the equations results in inconsistency. Although the two-step estimator is less efficient if both equations are correctly specified, the estimator is less sensitive to inconsistency because it only relies on conditional moments (cf. Beblo *et al.*, 2003).

¹⁰ Wooldridge (2002) stated that when a count variable only takes a small number of values count data models are more appropriate than Tobit models (p. 520).

¹¹ We use the Lagrange Ratio test to test for overdispersion. With a Lagrange Ratio statistic of 49.638, we are sure that the Negative Binomial Regression model is preferred above the Poisson model. See Cameron and Trivedi (1998).

¹² As all equations include the same regressors, seemingly unrelated regression models are not needed (even if the three errors are correlated, ordinary least squares and Generalized Least Squares will provide identical estimators) and simultaneous models fail identification.

¹³ The three variables that form the category *HPW* are not jointly significant either.

¹⁴ The variables measuring *HPW* are not jointly significant either.

¹⁵ We also estimated the explanatory variables on the hours spend on tasks from which workers learn. As the results of this estimation are comparable to the one in which informal learning is measured in fractions, we decided not to include these results explicitly in the paper.

¹⁶ The human resource development practices are not jointly significant either, nor are the variables measuring *HPW*.

¹⁷ Results do not change if we estimate a simple ordinary least squares model for informal learning.

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